BODDINGTON GOLD MINE PROJECT - ENHANCEMENT OF FACILITIES

WORSLEY ALUMINA PTY LTD

Report and Recommendations
of the
Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia

Bulletin 313 December 1987

ISSN 1030-0120

ISBN 0 7309 1678 2

CONTENTS

APPENDIX

i SUMMARY AND RECOMMENDATIONS

SUMMARY

Worsley Alumina Pty Ltd has submitted a proposal to upgrade the existing Boddington Gold Mine facilities by increasing the maximum daily process plant throughput from 8 000 tonnes to 12 000 tonnes.

Ore would continue to be mined from the same orebody currently being mined. It is therefore expected that the proposed increases in the rate of production would shorten the overall project life from fifteen to possibly ten years.

The plant facilities required for the upgrading would be an additional crusher, a ball or semi-autogenous grinding mill, additional classification cyclones and a leach tank. Residue transfer pumps would also require upgrading. It is proposed that other areas of the plant would remain the same, and no additional clearing beyond the existing plant site perimeter would be required.

To provide adequate process water for the upgraded plant, it is proposed to enhance the water supply system by upgrading the pump station on the Hotham River, and to duplicate the delivery pipeline to the Water Supply Reservoir.

It is also proposed to increase the capacity of the Water Supply Reservoir by raising the maximum surface water level by 0.9 m. This would be achieved by installing a deflatable rubber dam on the crest of the existing spill way. No further clearing around the reservoir would be required.

In considering the Company's initial proposal to upgrade the mining facilities the Authority determined that the potential for environmental impact was such that the proposal would require formal assessment under Part IV of the Environmental Protection Act, 1986 and that the level of assessment would be Notice of Intent.

Upon assessment of the Notice of Intent that was submitted by the Company the Authority has determined that the proposed enhancement of facilities at the Boddington Gold Mine would be environmentally acceptable and makes the following recommendations.

RECOMMENDATIONS

1. **The Environmental Protection Authority recommends that upgraded operations are carried out in accordance with the commitments documentated in the Environmental Management Programme for the Boddington Gold Mine (Appendix A).**

2. **The Environmental Protection Authority notes that the Company must comply with all licence conditions set by the Water Authority of Western Australia for abstraction of water from the Hotham River.**

   The Environmental Protection Authority recommends that pumping from the Hotham River should only take place when the river flow is in excess of 342 kilolitres per hour. Total pumping from the river should not cause the remaining flow to be reduced below level of 342 kilolitres per hour (River flow measured at Marradong River bridge gauging station).

The Authority further recommends that the proponent be required to negotiate agreements, to the satisfaction of the Minister for Water Resources, with any other major user of water from the Hotham River in order to ensure that overall pumping does not reduce flow below 342 kilolitres per hour.

The minimum flow rate of 342 kilolitres per hour should be reviewed by the Water Authority of Western Australia after two winter flows and advice given to the Environmental Protection Authority as to whether this rate is having undesirable environmental impacts.

1. BACKGROUND

Worsley Alumina Pty Ltd as the manager of the Boddington Gold Mine Project has submitted a proposal to upgrade the existing Boddington Gold Mine facilities by increasing the maximum daily process plant throughput from 8 000 tonnes to 12 000 tonnes.

Ore would continue to be mined from the same orebody currently being mined. It is therefore expected that the proposed increase in the rate of production would shorten the overall project life from fifteen to possibly ten years.

Approval for the commencement of the gold mining operations near Boddington was given to the Worsley Alumina Joint Venturers by the State Government in December 1985 following the assessment of the Environmental Review and Management Programme (ERMP) that was submitted to EPA for the project. In its report on the project the Environmental Protection Authority (EPA) concluded that it would be environmentally acceptable subject to the Joint Venturers adhering to the commitments made in their ERMP and subsequent submissions and compliance with nineteen specific recommendations. Further to the Authority's assessment of the proposal on Environmental Management Programme was prepared by the Joint Venturers detailing all aspects of environmental management pertaining to this project. The project was commissioned in July 1987.

2. PROPOSAL

The proposed expansion of the gold processing facilities would generally involve some modification to the existing processing plant and water supply facilities. This would allow for the gold ore to be mined and processed at a faster rate.

2.1 METALLURGICAL TREATMENT PLANT MODIFICATIONS

Upgrading of the processing plant would require the installation of an additional crusher and ball mill along side of the existing crushing and grinding facilities.

The carbon-in-leach gold extraction circuit would require an additional leach tank to handle increased production. This would also be located beside the existing bank of two leach and seven leach/adsorption tanks.

These changes would not require any additional forest clearing beyond the existing Plant Site perimeter.

2.2 WATER SUPPLY UPGRADING

Processing of the gold ore at a higher rate would require an increased water supply.

Most of the water for the current operations is obtained through pumping water from the Hotham River to a water storage dam that was constructed for that purpose. To increase pumping capacity, additional pumps would need to be installed at the Hotham River pump station and a parallel pipeline would also need to be constructed. The maximum instantaneous pumping rate is proposed to be increased from 1 080 kL/h to 2 200 kL/h which is the maximum permitted by the Company's existing water extraction licence. The pipeline would be constructed within the existing clearing for the currently operating pipeline.

The capacity of the Water Supply Reservoir would also need to be increased by raising the maximum surface water level by 0.9 metres. This could be accommodated within the existing area cleared for the Water Supply Reservoir, which provides a 2 m (vertical) cleared area above the current top water level. It is proposed that a deflatable rubber dam be installed on the existing spillway crest. In the event of flood waters causing the water level in the dam to rise above a pre-determined level, the dam could be deflated in a controlled manner based on stream flow and meteorological continuous monitoring data.

3. ENVIRONMENTAL ASSESSMENT

In considering the Company's initial proposal to upgrade the mining facilities the Authority determined that the proposal would require formal assessment under Part IV of the Environmental Protection Act, 1986 and that the level of assessment would be Notice of Intent.

A Notice of Intent has been submitted by the Company addressing the environmental aspects of the proposal in the context of the Environmental Management Programme that has been adopted for the existing operations.

4. ENVIRONMENTAL ISSUES

In its assessment of the proposal the Authority generally recognised that the majority of the impacts associated with the expansion proposals were of a marginally incremental nature to those of the existing operation. However, in light of the proposal that has recently been submitted by ALCOA of Australia to develop the Hedges Gold Project adjacent to the Boddington Gold Mine, the issue of water supply needed to be addressed with regard to available water resources. Diversion of water from the Hotham River by both Companies may have an adverse impact on the Hotham/Murray River system as well as other downstream users.

Detailed information on river flow characteristics and requirements for both operations has been supplied by Worsley Alumina Pty Ltd.

A minimum allowable flow rate of 246 ML/month (equivalent to 342 kL/h) has been determined by the Water Authority of Western Australia in consultation with the Environmental Protection Authority which would allow the environmental impacts of pumping from the Hotham River to be managed. This rate of flow is monitored on a continuous basis at the Marradong Road bridge gauging station by the Water Authority of Western Australia. No pumping may take place whenever flow in the Hotham is below this minimum level to ensure that the environmental values associated with the River are protected.

Maximum pumping for the upgraded Boddington Gold Mine is proposed at a rate of 2 200 kL/h and pumping requirements for the Hedges Project are 2 000 kL/h, as specified in the Environmental Review and Management Programme for that project. At a constant rate of pumping this would amount to the equivalent of about 3 125 ML/month which represents about 13% of the median flow above minimum allowable flow for the month of July. It has been calculated that this rate of pumping should be able to be sustained from June through October based on Water Authority of Western Australia median flow figures. Total median flow for the winter period is about 59 000 megalitres and is at its peak in July at 24 460 ML/month. It is considered that this would accommodate all current proposals for extraction of water particularly if pumping capacities are such that maximum advantage may be taken of peak flows.

During the months of lower flow and particularly during drier than average years arrangements for proportional use of the water would need to be negotiated between the proponent and other major users to ensure that no pumping takes place to reduce flow below 342 kilolitres per hour.

Other aspects of the proposal were not considered to have a significant environmental impact potential as no additional forest clearing would be required.

It was also noted that the proposal would not result in a greater overall quantity of ore being mined and processed but would increase the rate in which it would be processed, hence shortening the life of the project.

5. CONCLUSION

Upon assessment of the Worsley Aluminia Pty Ltd proposal the Authority has concluded that the proposed enhancement facilities at the Boddington Gold Mine would be environmentally acceptable provided that:

(i) upgraded operations are carried out in accordance with the commitments documented in the Environmental Management Programme for the Boddington Gold Mine (Appendix A); and

(ii) The Environmental Protection Authority notes that the Company must comply with all licence conditions set by the Water Authority of Western Australia for abstraction of water from the Hotham River.

The Environmental Protection Authority recommends that pumping from the Hotham River should only take place when the river flow is in excess of 342 kilolitres per hour. Total pumping from the river should not cause the remaining flow to be reduced below level of 342 kilolitres per hour (River flow measured at Marradong River bridge gauging station).

The Authority further recommends that the proponent be required to negotiate agreements, to the satisfaction of the Minister for Water Resources, with any other major user of water from the Hotham River in order to ensure that overall pumping does not reduce flow below 342 kilolitres per hour.

The minimum flow rate of 342 kilolitres per hour should be reviewed by the Water Authority of Western Australia after two winter flows and advice given to the Environmental Protection Authority as to whether this rate is having undesirable environmental impacts.

SUMMARY OF ENVIRONMENTAL COMMITMENTS

The following list is a summary of the major environmental commitments for the Boddington Gold Mine Project. Some of the commitments relate to the recommendations of the EPA report on the project proposal (October 1985), as noted emboldened in square brackets after these commitments:

- Clearing for project activities will be kept to a minimum, consistent with safe operating practices.

- Topsoil from areas cleared for project activities will be salvaged for use in decommissioning and other rehabilitation programmes **[EPA Recommendation 12]**.

- Environmentally-sensitive construction and operational practices, including stringent forest hygiene measures, will be employed throughout the project area (see Exhibit H, Appendix A; Environmental Checklist, Appendix E).

- The operation will be licensed in accordance with the requirements of the Environmental Protection Act, 1986 (includes air, water and noise pollution control).

- The State will continue to be compensated for clearing of State Forest under the terms of the Alumina Refinery (Worsley) Agreement Act, 1973 (as amended).

- Alternative access from private land around the Water Supply Reservoir to State Forest to the west of the project area has been provided for local bush fire brigades and CALM.

- Biological monitoring programmes, based on information provided to the State in the draft report on baseline biological investigations, will be developed in consultation with the State. Results of these monitoring programmes will be reported to the State and changes to management and procedures developed as necessary with the State **[EPA Recommendations 1 and 2]**.

- A quantified assessment of likely impacts of project clearing on streamflow and quality of Thirty-Four Mile Brook has been carried out with the Water Authority of Western Australia (see Appendix B). In consultation with the EPA and the Water Authority, existing surface and groundwater monitoring programmes are being extended to facilitate progressive planning and management of project activities, particularly mining and residue storage, to minimize adverse hydrological and hydrogeological effects **[EPA Recommendations 9 and 10]**.

- Rehabilitation of project areas will be carried out in consultation with the State and, where appropriate, the land owner, with the aim of maintaining the water quality of Thirty-Four Mile Brook so that the Water Supply Reservoir would be a viable long-term source of public water supply. If, at the time of decommissioning, the State requires the Water Supply Reservoir as a potable water source, the water quality in the reservoir will be

reassessed and, should it prove to be unsuitable, the Joint Venturers will drain the dam, allowing it to refill naturally **[EPA Recommendation 11]**.

- The downstream user of Thirty-Four Mile Brook is being compensated for reduced flows due to the construction of the Water Supply Reservoir.

- A programme for regular assessments of forest health, including tree growth monitoring, is being established adjacent to the Mining Area in consultation with the EPA and CALM. If disease spread unacceptable to the State is detected, operational practices will be reviewed and modified **[EPA Recommendation 3]**.

- The State has been provided with the results of studies and assessments on the likely effects on the environment of cyanide, caustic soda and viscosity modifier used in the process and deposited with residue **[EPA Recommendation 5]**.

- As part of applications for permission to divert water (Rights in Water and Irrigation Act, 1914 [as amended]) and for a Works Approval (Environmental Protection Act, 1986), the State has been provided with the detailed design reports and reports on geotechnical, hydrological and hydrogeological investigations carried out for the Water Supply Reservoir and the Residue Management System, including monitoring/recovery borefields **[EPA Recommendations 6 and 8]**.

  Additional information has been provided in relation to atmospheric emissions and noise aspects of the Works Approval.

- If unacceptable quality is detected in groundwater monitoring bores around the Residue Disposal Area, one of the remedial actions described in Section 8.3.3 will be adopted.

- Material from residue and reclaim pipeline leaks/breakages will be contained at low points along the residue pipeline route and transported to the Residue Disposal Area. If spills are not fully contained, WAPL will carry out clean-up and rehabilitation of affected areas in consultation with the State.

- In the unlikely event of a dam failure, including the overtopping of the Process Water Pond, the Joint Venturers will assume responsibility for clean-up and rehabilitation to the satisfaction of the State **[EPA Recommendation 7]**.

- The Hotham River Pump Station has been designed (size of structure, colour of structure and equipment) to minimize visual impact. Noise from the electrically-driven pumps and from temporary diesel alternators (permanent power is scheduled for connection in mid-1987) has been evaluated in relation to neighbourhood noise legislation and appears unlikely to be a problem; however, equipment modification will be evaluated should problems arise **[EPA Recommendation 17]**.

- All waste and spilt materials in the Metallurgical Treatment Plant area will be contained within the process operation for reuse, or disposed of as appropriate.

- Caustic soda used in the Metallurgical Treatment Plant will have a mean mercury content of less than 100 µg/L, with a maximum value of 1,000 µg/L **[EPA Recommendation 4]**.

- Stormwater runoff from the cleared area of the Plant Site will flow into the Process Water Pond, which has been lined with clay to minimize leakage. The pond will have sufficient capacity to accommodate rainfall runoff from a one in one hundred year storm event.

- Noise during blasting operations will be limited, by the conditions of the Mining Contractor's contract, to less than 120 dB linear at the nearest residence, some 6 km from the blast site.

- Drainage will be installed in the mine pits, with runoff either used for dust suppression, or drained via silt traps to natural watercourses.

- Perimeter drains will be installed around mine pits and stockpiles; water from these and from haul roads will drain through silt traps into natural watercourses.

- The objective of the management of runoff from the mining operations will be to minimize the potential spread of forest disease and to reduce the long-term salinity and turbidity impact on Thirty-Four Mile Brook.

- Mine waste not used in road construction will be returned as backfill to mine pits during the life of the project.

- If it is decided not to process marginal ore, this material will be returned to mined-out pits.

- Shallow mine pits will be contoured to slopes generally consistent with natural landforms **[EPA Recommendation 13]**.

- Deeper pits will be rehabilitated if, at the time of completion of mining the weathered profile, no decision to mine bedrock has been made. Should a decision to mine bedrock be made, detailed plans will be submitted to the State for approval **[EPA Recommendations 15 and 16]**.

- Final rehabilitation will ensure that runoff will drain to natural watercourses or into the deeper pits.

- Ten-year mining plans will be prepared and submitted to the State as part of the existing arrangements for the Worsley Alumina Project, and will be regularly updated **[EPA Recommendation 14]**.

- The State will be provided with brief annual and comprehensive triennial environmental management reports as part of existing arrangements for the Worsley Alumina Project **[EPA Recommendation 19]**.